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(दूसरा पुनरीक्षण)

Steam-Jacketed Ghee Pans / Boilers (Stainless Steel) — Specification

(Second Revision)

ICS 67.260

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Dairy Products and Equipment Sectional Committee, FAD 19

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Dairy Products and Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

Ghee pans are used to make ghee from milk cream or butter by boiling with the help of steam. The construction of ghee pans should be such that the ghee made in it shall have the characteristic aroma, it shall not char and the pan shall meet the hygienic requirements of food processing equipment.

This standard is intended to give the general technical requirements of stationary and hemispherical steam-jacketed pans.

This standard was first published in 1964 and subsequently revised in 1979. In this second revision, various provisions have been reviewed and updated in the light of latest technological developments in the country. Besides, the figure of typical steam-jacketed stationary ghee pan with scrapper type agitator has been included for information and guidance.

The steam-jacket has been specified to withstand a nominal steam pressure of 3.0 kg/cm^2 as this has been found to be sufficient for making ghee from cream and butter.

This standard contains clauses **5.5** and **7.1** (j), which call for agreement between the purchaser and the supplier.

Unless otherwise specifically mentioned, the word 'stainless steel' appearing at various places in this code shall mean ISS 304 (equivalent to AISI 304) stainless steel conforming to designation X04Cr19Ni9 of IS 6911 : 1992 'Stainless steel plate, sheet and strip — Specification (*first revision*)'. Only Stainless Steel Tungsten Inert Gas (TIG) Arc Welding using AWS ER 316L filler metal conforming to IS 2811 : 1987 'Recommendations for manual tungsten inert-gas arc welding of austenitic stainless steel (*first revision*)'shall be done for all joints in stainless steel sheet. The weld areas and the deposited weld material shall be as corrosion resistant as the parent material.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STEAM-JACKETED GHEE PANS/BOILERS (STAINLESS STEEL) — SPECIFICATION

(Second Revision)

1 SCOPE

This standard prescribes the requirements for stainless steel steam-jacketed ghee pans.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
2811 : 1987	Recommendations for manual tungsten inert-gas arc welding of austenitic stainless steel (*first revision*)
2825 : 1969	Code for unfired pressure vessels
3178 : 1996	Abrasive emery grain — Specification
3382 : 1965	Specification for stainless steel milk pipes and fittings
3624 : 1987	Specifications for pressure and vacuum gauges (*second revision*)
6911 : 2017	Stainless steel plate, sheet and strip — Specification (*second revision*)

3 CAPACITY

3.1 The pan shall be constructed with a nominal capacity of 250, 500, 1 000 and 1 500 l. For the purpose of this standard, the nominal capacity is the volumetric capacity of ghee pan/boiler. The brimful capacity should be 15 percent more than the nominal capacity.

3.2 A tolerance of ±5 percent shall be allowed on the nominal capacity.

4 MATERIALS

4.1 All component metallic parts which come into contact with the milk products shall be constructed from stainless steel conforming to steel grade designation ISS 316 as per IS 6911. The steam-jacket may be made of stainless steel grade designation ISS 304 having Cr 18-20 percent and Ni 8-10 percent as per IS 6911.

4.2 Non-metallic material may be used for sealing, but such material shall be non-toxic, relatively non-absorbent, and shall not impart any flavour or dissolve in the milk products, cleaning solutions or bactericidal agents normally used.

4.3 All such parts or the surfaces which do not come into contact with the milk products shall be made of such material which is either corrosion resistant, or made so by a suitable preventive treatment on a prepared surface.

5 GENERAL REQUIREMENTS

5.1 The pans shall be constructed with cylindrical body and hemispherical dished bottoms. The pans shall be of the stationary type only.

5.2 Girder

A girder fabricated from 5 mm thick stainless steel conforming to steel grade designation ISS 316L for mounting agitator and covers shall be provided for ghee pans of capacity 500 l and above.

5.3 Covers

The pans shall be provided with semi-circular, removable covers of 2 mm thick stainless steel fabricated in two halves. The covers shall have lifting handles.

5.4 The jacket shall cover the hemispherical bottom as well as the cylindrical portion of the ghee pan/boiler.

5.5 The pan may be provided with an anti-splash brim, if required by the purchaser.

5.6 The thickness of the material for the pan and the jacket shall be such as to withstand a steam pressure of 3.5 kg/cm^2 and shall conform to IS 2825 wherever applicable.

6 FABRICATION

6.1 The steam-jacketed ghee pan/boiler shall be fabricated in such a manner as to conform to the requirements laid down in 2 to 6 of the standard. The line drawing of typical steam-jacketed stationary type ghee pans/boilers is given in Fig. 1.

6.2 Inner Pan

The inner pan with cylindrical body, hemispherical bottom and reinforced brim shall be fabricated from 6 mm thick stainless steel plate conforming to steel grade designation ISS 316L.

6.2.1 *Weld Joints*

All joints, which come into contact with the milk products, shall be butt-welded and finished smooth by buffing. The weld areas and the deposited weld material shall be as corrosion resistant as the parent material.

6.2.2 *Finish of Stainless Steel Surface*

All surfaces, which come into contact with the milk products, shall be free from crevices and have a smooth finish. Either 2B mill finish of all the stainless steel surfaces shall be retained or finished smooth by buffing with IS Grit No. 220 (*see* IS 3178). All welding joints shall also be finished smooth by buffing with IS Grit No. 220.

6.2.3 All component parts and appurtenances having surfaces in contact with the milk products shall be easily removable for cleaning or shall be readily cleansable in their places.

6.2.4 Outlets

a) *Bottom outlet* — The stationary pans shall have vertical outlets at the centre of bottom to facilitate removal of the contents. These outlets of inside diameter not less than 38 mm for 250 l pans, 51 mm for 500 l pans and 63.5 mm for the 1 000 and 1 500 l pans shall be provided with stainless steel straight through plug type flanged valve ending in complete stainless steel union. The outlet shall be at a clear height of not less than 650 mm from the finished floor level to facilitate placement of can under it.

b) *Side outlet* — A horizontal stainless steel side outlet of size not less than 38 mm for 250 l pans, 51 mm for 500 l pans and 63.5 mm for the 1 000 and 1 500 l pans shall be provided with stainless steel angular flanged valve ending in complete stainless steel union for taking out clear ghee.

6.2.5 The brim of the pan shall be reinforced for strength by turning the top edges outside over a carbon steel reinforcing band or by turning the top edge outside or folding on the outside.

NOTE – This provision shall not apply, if the pan is made to meet the requirements under **5.5**.

6.3 Jacket (Intermediate Shell)

6.3.1 The jacket (intermediate shell) with cylindrical body and hemispherical bottom shall be fabricated from SS (AISI 304) plate of suitable thickness (6 mm) and welded on the outside of the inner pan.

6.3.2 The jacket space shall be sufficiently large for the distribution of steam over the heating surface.

6.3.3 Branches and bosses for the jacket shall be welded.

6.3.4 The jacket shall have the following branches:

a) Automatic air vent located at the top most portion of the steam jacket opposite the steam inlet connection for stationary type pans. The air vent shall be of the minimum inside diameter of 10 mm for pans of 250 and 500 l capacities and 20 mm for pans of 1 000 l and 1 500 l capacities;

b) Steam inlet of a minimum of 25 mm inside diameter for pans of 250 and 500 l capacities and 38 mm for pan of 1 000 l and 1 500 l capacities;

c) Condensate outlet of a minimum of 12 mm internal diameter for pans of 250 and 500 l capacities, 20 mm for pans of 1 000 l and 1 500 l capacities. The condensate removal assembly shall consist of strainer, float type steam trap, sight glass and bye pass arrangement complete with isolating valves and suitable flange joint for each removable component; and

d) Suitable baffle or diverter on the steam inlet to prevent direct impingement of steam on the outer surface of inner pan and an extra stainless steel padding of adequate thickness at a place where steam hits inner pan, to sustain steam at a pressure of 3.5 kg/cm^2. Alternatively, a steam sparger pipe in the jacket in place of item mentioned above.

6.4 Insulation

100 mm thick crown 150 resin bonded fibre glass wool insulation (density of 24 Kg/m^3) shall be applied with chicken wire mesh so as to eliminate hollow space between outer casing and the intermediate jacket shell. The insulation shall cover the bottom as well as the cylindrical body.

6.5 Outer Casing

The outer casing with cylindrical shell and hemispherical bottom fabricated from 3 mm thick stainless steel (AISI 304) sheet shall be welded and completely sealed so as to avoid penetration of moisture or vermin into the insulation.

6.6 Supports

The pan shall be supported on four legs of stainless steel (AISI 304) and stainless steel ball feet provided at the bottom of the tank. The legs shall be welded rigidly by providing suitable attachments or pads. The ball feet shall have provision for height adjustment of 50 mm for proper levelling of the ghee pans. The legs shall have cross bracers.

7 ACCESSORIES

The pan shall be provided with the following accessories:

a) Pressure gauge of range 0 to 8.0 kg/cm^2 (*see* IS 3624), with siphon and isolating cock. The dial shall have a red mark at 3.0 kg / cm^2 division;

b) Control valve to isolate steam supply to the jacket;

c) Assembly to automatically remove the condensate from the jacket as described under **6.3.4** (c);

d) Non-return valve to effectively eject air from the jacket;

e) Outlet valves for the outlets. The outlet valve shall conform to IS 3382;

f) A thermowell made from stainless steel conforming to conforming to steel grade designation ISS 316 L with suitable connection for fixing stem of dial type thermometer to measure the temperature of product. The portion of the thermowell, which is in the steam jacket, shall be insulated with mineral wool or equivalent and totally shrouded so that the insulation does not come in contact with steam. Dial type indicating thermometer shall have a range of 50^o to 150^{o}C, graduated in 1^{o}C divisions;

g) Pressure relief valve capable of being set to blow off when pressure in the jacket exceeds the designed pressure by 0.5 kg/cm^2;

NOTE – A pressure reducing valve and pressure gauge shall be provided by the user in case the pressure of steam in the mains is higher than the working pressure of the pan.

h) The pans of 500 l and above capacities shall be fitted with a scraping or sweeping type conforming to steel grade designation ISS 316 agitator with vertical geared motor complete with oil seal, supporting arrangement, support on the pan bottom etc. The mechanical agitator shall be suspended from the girder (bridge) over the pan; and

j) If required by the purchaser, the ghee pans may be provided with graduated dip-sticks suspended in suitable fixed brackets.

8 TESTS

8.1 Leakage Test for Pan

The pan with the fittings shall not leak when filled with water upto the brim and allowed to stand for six hours.

8.2 Dye penetration test shall be conducted for all welding joints of inner shell to ensure no defects.

8.3 Pressure Test for Jacket

The jacket shall be designed for a steam working pressure of 3.0 kg/cm^2. The jacket with the fittings and accessories shall be hydraulically tested at manufacturer's works for a pressure of 4.5 kg/cm^2. The pressure shall be applied in the space between the pan and the jacket and shall be maintained for a period of not less than 30 minutes. The jacket shall be free from leaks.

9 MARKING

9.1 Each pan shall be provided with a stainless steel nameplate of size 150 mm × 100 mm fixed on a stainless steel bracket. Following particulars shall be marked legibly and permanently on the name plate:

a) Manufacturer's trade-mark, name and address;

b) Manufacturer's identification;

c) Capacity of the pan;

d) Safe working pressure;

e) Test pressure and date of test; and

f) Month and year of manufacturing

9.2 BIS Certification Marking

Each pan may also be marked with the BIS Certification Mark.

9.2.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

Bureau of Indian Standards

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Amendments Issued Since Publication

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